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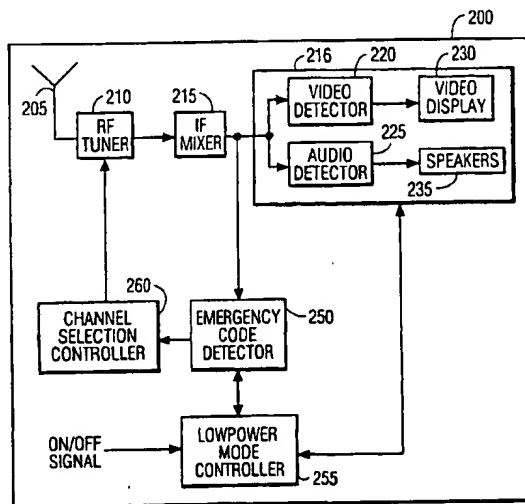
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(54) Title: **SYSTEM AND METHOD FOR BROADCASTING EMERGENCY WARNINGS TO RADIO AND TELEVISION RECEIVERS IN LOW POWER MODE**



(57) Abstract: There is disclosed an emergency warning system for use in an appliance comprising a radio frequency (RF) receiver capable of receiving a broadcast radio signal or a broadcast television signal when the appliance is operating in a standby mode. The emergency warning system comprises a detector coupled to the RF receiver for detecting an emergency code in the received broadcast radio signal or broadcast television signal and generating a first signal. The emergency warning system also comprises a low power mode controller coupled to and receiving the first signal from the detector. The low power mode controller, in response to the first signal, switches the appliance from the standby mode to an active mode wherein the RF receiver processes and plays the received broadcast radio signal or a broadcast television signal.

System and method for broadcasting emergency warnings to radio and television receivers in low power mode

## TECHNICAL FIELD OF THE INVENTION

The present invention is directed, in general, to emergency broadcasting systems and, more specifically, to an emergency broadcasting system capable of activating radio and television receivers operating in low-power mode/standby mode.

5

## BACKGROUND OF THE INVENTION

Today's emergency warning systems provide citizens with audible and/or visual signals which alert them to present or impending danger. As technology has advanced, the sophistication of public alarm systems has also advanced. Emergency warning systems include sirens and radio and television broadcasts. The systems are intended to reach the greatest number of people possible, as quickly as possible.

In order to improve alarm coverage, the Emergency Broadcast System (EBS) was created during the Cold War. During a federal, state or local emergency, AM and FM radio stations, and broadcast television stations, and cable television stations may transmit area-wide emergency messages to receivers in the emergency area. In the case of television, this emergency warning signal may consist of an audible alarm tone, a static alarm symbol, such as tornado funnel cloud or a test pattern, a text message which scrolls across a portion of the television screen, or a live broadcast by, for example, a news reporter.

However, problems continue to exist in contacting all individuals within the alarm area. There is no guarantee that everyone within the geographical area of concern will receive the alarm warning. For instance, audible alarm systems, such as sirens, are used to notify people within a particular geographic area of the presence of emergency situations that may endanger them, such as tornadoes, fires, toxic hazards, and the like. There may be an insufficient number of sirens to cover an particular area properly, so that some individuals are not close enough to the nearest siren tower to hear the alarm. This is especially true in rural areas. Additionally, some individuals may be inside well-insulated buildings, so that the alarm cannot penetrate to their location. In the case of television and radio alarms, it is always possible that individuals may not have their television and/or radio turned on when a warning is broadcast. This is particularly true at night, when people are sleeping.

There is therefore a need in the art for improved emergency warning systems. In particular, there is a need for an improved emergency warning system that can reach people in remote areas who may not have their television or radio turned on.

## 5 SUMMARY OF THE INVENTION

To address the above-discussed deficiencies of the prior art, it is a primary object of the present invention to provide an emergency warning system, for use in an appliance comprising a radio frequency (RF) receiver capable of receiving at least one of a broadcast radio signal and a broadcast television signal when the appliance is operating in a standby mode. In an advantageous embodiment of the present invention, the emergency warning system comprises 1) a detector coupled to the RF receiver capable of detecting an emergency code in the received at least one of a broadcast radio signal and a broadcast television signal and, in response to the detection of the emergency code, generating a first signal; and 2) a low power mode controller coupled to and receiving the first signal from the detector, wherein the low power mode controller, in response to the first signal switches the appliance from the standby mode to an active mode wherein the RF receiver processes and plays the received at least one of a broadcast radio signal and a broadcast television signal.

In one embodiment of the present invention, the emergency warning system further comprises a channel selection controller coupled to the detector wherein the channel selection receives from the detector a second signal capable of causing the channel selection controller to tune the RF receiver to a first channel.

In another embodiment of the present invention, the first channel is a predetermined default channel.

In still another embodiment of the present invention, the first channel is a last-selected channel to which the RF receiver was tuned when the appliance entered the standby mode.

In yet another embodiment of the present invention, the first channel is determined by a data value associated with the emergency code.

In a further embodiment of the present invention, the detector is capable of controlling a volume level of the RF receiver.

In a still further embodiment of the present invention, the detector causes the RF receiver to increase a volume level of an audible signal associated with the at least one of a broadcast radio signal and a broadcast television signal.

The foregoing has outlined rather broadly the features and technical advantages of the present invention so that those skilled in the art may better understand THE DETAILED DESCRIPTION OF THE INVENTION that follows. Additional features and advantages of the invention will be described hereinafter that form the subject of the claims of the invention. Those skilled in the art should appreciate that they may readily use the conception and the specific embodiment disclosed as a basis for modifying or designing other structures for carrying out the same purposes of the present invention. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the invention in its broadest form.

Before undertaking the DETAILED DESCRIPTION OF THE INVENTION, it may be advantageous to set forth definitions of certain words and phrases used throughout this patent document: the terms "include" and "comprise" and derivatives thereof, mean inclusion without limitation; the term "or," is inclusive, meaning and/or; the phrases "associated with" and "associated therewith," as well as derivatives thereof, may mean to include, be included within, interconnect with, contain, be contained within, connect to or with, couple to or with, be communicable with, cooperate with, interleave, juxtapose, be proximate to, be bound to or with, have, have a property of, or the like; and the term "controller," "processor," or "apparatus" means any device, system or part thereof that controls at least one operation, such a device may be implemented in hardware, firmware or software, or some combination of at least two of the same. It should be noted that the functionality associated with any particular controller may be centralized or distributed, whether locally or remotely. Definitions for certain words and phrases are provided throughout this patent document, those of ordinary skill in the art should understand that in many, if not most instances, such definitions apply to prior, as well as future uses of such defined words and phrases.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, wherein like numbers designate like objects, and in which:

FIGURE 1 illustrates an exemplary emergency broadcast system in accordance with one embodiment of the present invention;

FIGURE 2 illustrates an exemplary television capable of receiving an emergency broadcast system during low-power mode in accordance with one embodiment of the present invention; and

FIGURE 3 is a flow chart illustrating a broadcast operation for transmitting an emergency message to an exemplary television operating in low-power mode in accordance with one embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE INVENTION

FIGURES 1 through 3, discussed below, and the various embodiments used to describe the principles of the present invention in this patent document are by way of illustration only and should not be construed in any way to limit the scope of the invention. Those skilled in the art will understand that the principles of the present invention may be implemented in any suitably arranged broadcast system and RF receiver.

FIGURE 1 illustrates exemplary emergency broadcast system (EBS) 100 in accordance with one embodiment of the present invention. EBS 100 comprises public switched telephone network (PSTN)/ Internet 120 which transfers emergency warning signals from public safety agencies to a television (TV)/radio broadcast facility 110. Public safety agencies may include Federal Emergency Management Agency (FEMA) 131, National Weather Service (NWS) 132, police service 133, and fire service 134.

TV/radio broadcast facility 110 comprises incoming alarm notification controller 150, broadcast controller 155, radio frequency (RF) transmitter 160, broadcast program data 165, and memory 170. Incoming alarm notification controller 150 receives alarm notifications from one or more of FEMA 131, NWS 132, police service 133, and service fire 134 via PSTN/Internet 120 and causes an alarm message to be transferred to broadcast controller 155 when an EBS alarm is present. Under normal (non-emergency) operating conditions, broadcast controller 155 enables the transfer of broadcast program data 165 to RF transmitter 160. When it detects the presence of an EBS alarm condition from incoming alarm notification controller 150, broadcast controller 155 causes the indicated EBS alarm message to be transferred to RF transmitter 160.

RF transmitter 160 is a conventional RF transmitter which converts the normal broadcast program or EBS alarm message signals from broadcast controller 155 to a radio frequency and power level for output to TV/radio receivers throughout the broadcast area. In the case of a cable station, RF transmitter 160 may be coupled to a cable network, rather than to a transmission antenna. Broadcast program data 165 provides standard non-emergency

program data for output to broadcast controller 155. Broadcast program data 165 may comprise “live” programs, such as news and sports, or pre-recorded programs, such as music, television movies, sitcoms, and the like. Broadcast program data 165 may be provided by a local source, such as a news studio, or by a remote source, such as a network feed.

5           Memory 170 provides storage for an application program executed by incoming alarm notification controller 150, as well as storage for emergency code 180, audio emergency message(s) 181, and video emergency message(s) 182. Emergency code 180 represents the portion of memory 170 which is allocated for the storage of one or more emergency code(s) associated with the EBS message(s) received by incoming alarm  
10 notification controller 150. Typically, emergency code 180 stores a single EBS code though additional codes may be provided.

          Audio emergency message(s) 181 stores one or more audio emergency message(s) associated with the received EBS alarm signal. The audio message(s) may be pre-recorded for each expected alarm type or may be received via PSTN/Internet 120 from  
15 one or more of FEMA 131, NWS 132, police service 133, and service fire 134. Similarly, video emergency message(s) 182 stores one or more video emergency message(s) associated with the received EBS alarm signal. These video messages may be pre-recorded for each expected alarm type or may be received via PSTN/Internet 120 from one or more of FEMA 131, NWS 132, police service 133, and service fire 134. Video emergency message(s) 182 is  
20 used for the TV broadcast signals output by TV/radio broadcast facility 110.

          Under normal operating conditions, TV/radio broadcast facility 110 transmits regularly scheduled television and/or radio programs provided by broadcast program data 165. When incoming alarm notification controller 150 detects the presence of an EBS alarm from PSTN/Internet 120, incoming alarm notification controller 150 interrupts the normal  
25 broadcast and causes emergency code 180 and one or more of audio emergency message(s) 181 and video emergency message(s) 182 to be transmitted by TV/radio broadcast facility 110. After a pre-determined time under program control or station control, incoming alarm notification controller 150 enables broadcast controller 155 to again output the normally scheduled broadcast program.

30           FIGURE 2 illustrates exemplary television 200, which is capable of receiving an EBS message during low-power mode in accordance with one embodiment of the present invention. For the purposes of simplicity and brevity in explaining the operation of the present invention, the description that follows is directed toward an embodiment in which the present invention is implemented in a television set. However, this is by way of illustration

only. It should be clearly understood that the present invention may be implemented in any device that includes a radio receiver or a television receiver, including, for example, a television set, a stereo system, a conventional AM/FM radio in an automobile, a personal computer (PC) equipped with an RF tuner card capable of receiving radio or television signals, among other devices.

Exemplary television 200 comprises television antenna 205, RF tuner 210, intermediate frequency (IF) mixer 215, standby mode circuitry 216, emergency code detector 250, low power mode controller 255, and channel selection controller 260. Under normal operating conditions, the ON/OFF status of television 200 is controlled by an operator using either a remote control or a manual switch to generate an ON/OFF signal that controls low power mode controller 255. Except for standby mode circuitry 216, the indicated circuits of television 200 operate and receive electrical power even when power has been disabled i.e., placed in the standby mode) by enabling the OFF signal through the ON/OFF switch.

Television antenna 205 receives video RF signals from TV broadcast stations, such as TV/radio broadcast facility 110, and transfers these RF signals to RF tuner 210. Even when television 200 is in standby mode, RF tuner 210, under the direction of channel selection controller 260, downconverts a selected frequency channel of the received RF signal to an IF signal, which is transferred to IF mixer 215. IF mixer 215 downconverts the IF signal to baseband video and audio signals that normally are processed by the numerous circuit elements in standby mode circuitry 216. The baseband output of IF mixer 215 also is monitored by emergency code detector 250.

Standby mode circuitry 216 comprises the portions of television 200 that are required for the video and audio conversion of received signals. Standby mode circuitry 216 includes video detector 220, audio detector 225, video display 230, and speakers 235. Video detector 220 and audio detector 225 convert the baseband signals from IF mixer 215 to video signals and audio signals that are sent to video display 230 and audio speakers 235, respectively. Video display 230 provides means for viewing the received broadcast image(s) and speakers 235 provide the audio output associated with the received signals. In an alternate radio embodiment or the present invention, standby mode circuitry 216 may only comprise audio circuits providing the functions of a radio receiver.

The ON/OFF status of standby mode circuitry 216 is controlled by low power mode controller 255. Standby mode circuitry 216 is fully "ON" or operational when low power mode controller 255 is enabled by the ON/OFF switch or by emergency code detector

250 during an EBS alarm condition. Otherwise, standby mode circuitry 216 is in the OFF (or standby) mode.

Emergency code detector 250 monitors the received signal from IF mixer 215 to detect the presence of emergency code 180. If emergency code 180 is detected, emergency code detector 250 sends an activation (or "ON") signal to low power mode controller 255 that causes lower power mode controller 255 to apply full power to standby mode circuitry 216. In one embodiment, low power mode controller 255 maintains full power until disabled by the reception of an OFF command signal. In an alternate embodiment, low power mode controller 255 may maintain the emergency operational power level for a pre-determined or program-selected duration of time. For instance, the owner of television 200 may program select an emergency operational power duration of 60 minutes. After 60 minutes has expired without the reception of an EBS message, the power for standby mode circuit 216 will return to the OFF or "standby" level.

If emergency code 180 is detected, emergency code detector 250 also may send a channel selection signal to channel selection controller 260, which controls the channel frequency to which RF tuner 210 is tuned. In one embodiment of the present invention, emergency code detector 250 may send a channel selection signal that causes channel selection controller 260 to tune to a particular default channel that may be established by a telecommunication standard. In another embodiment of the present invention, emergency code detector 250 may send a channel selection signal that causes channel selection controller 260 to simply remain on the channel in which emergency code 180 was detected (i.e., no change). Thus, channel selection controller 260 tunes RF tuner 210 to the last operator-selected channel. In still another alternate embodiment, channel selection controller 260 may be placed in a channel-sequencing mode in which each channel is selected for a pre-determined or programmable period of time, or until the strongest signal is received. In still another embodiment of the present invention, emergency code 180 may additionally comprise a channel selection field that is detected by emergency code detector 250. The channel selection field contains the value of the field to which channel selection controller 260 tunes RF tuner 210. Thus TV/radio station 110 not only may remotely activate television 200, it also may remotely tune television 200 to any channel desired.

It may be assumed that if TV/radio station 110 transmitted emergency code 180 during an emergency, TV/radio station 110 will subsequently broadcast some type of emergency programming, such as audio emergency message(s) 181, video emergency messages(s) 182, or a live news report from a studio represented by broadcast program data



165. Thus, leaving RF tuner 210 tuned to the channel in which emergency code 180 was received will suffice for notifying the public of a pending emergency. However, tuning RF tuner 210 to a particular default channel established by a telecommunication standard ensures that television 200 will be tuned to an emergency broadcast channel when it is remotely  
5 activated by the transmission of emergency code 180.

FIGURE 3 depicts flow chart 300, which illustrates a broadcast operation for transmitting an emergency message to exemplary television 200 operating in low-power mode in accordance with one embodiment of the present invention. Flow chart 300 represents the operation of EBS 100 and television 200 during an emergency situation.  
10 Initially, TV/radio broadcast facility 110 receives an incoming emergency alert or alarm indication from one or more public safety agencies associated with EBS 100, such as FEMA 131, NWS 132, police service 133, and service fire 134, or others (process step 305).

In response, TV/radio broadcast facility 110 inserts emergency code 180 associated with the emergency alarm into the RF signal being broadcast (process step 310).  
15 For a radio broadcast facility, the "normal" audio program may be interrupted with the insertion and transmission of an audio message or tone associated with the emergency code. Optionally, TV/radio broadcast facility 110 may enable and transmit a pre-recorded or stored audio and/or video message that is associated with the indicated alarm. As another option, TV/radio broadcast facility 110 may insert and transmit a live audio/visual emergency  
20 message as it is directly received from one or more public safety agencies or from a news studio (process step 315).

Television and radio receivers in the coverage area of TV/radio broadcast facility 100 receive the transmitted RF message. These receivers include television and/or radio receivers which are in the standby or low power mode of the present invention (process  
25 step 320). Subsequently, emergency code detector(s) 250 in the television and/or radio receivers detect the presence of the emergency code and/or message in the RF signal (process step 325). The emergency code detector(s) 250 switch their respective television or radio receivers from standby to the operational or "ON" state (process step 330).

Channel selection controller(s) 260 associated with switched-ON receiver  
30 cause the associated TV or radio receiver to tune to a default or selected emergency channel. Optionally, each channel selection controller 260 may cause the RF tuner to set the volume of the radio or television to a "HIGH" level for emergency notification purposes (process step 340). Optionally, TV/radio receiver may play or display (as applicable) any transmitted

emergency audio or video message(s) associated with emergency code 180 (process step 345).

Thus, any person in the vicinity of a radio or television receiver which may be in the OFF (or standby) mode will still be alerted to the presence of an emergency situation.

- 5 When the disabled radio or television receiver detects the presence of an EBS alarm indication, it places the receiver in the ON condition, enables an emergency broadcast frequency or channel, optionally sets the volume to the HIGH level, and plays/displays the emergency message. The HIGH volume level increases the likelihood that individuals within hearing range, including sleepers, will be alerted to the alarm condition. Once enabled, the  
10 receiver may be manually placed in the OFF status until another EBS alarm indication is received.

Although the present invention has been described in detail, those skilled in the art should understand that they can make various changes, substitutions and alterations herein without departing from the spirit and scope of the invention in its broadest form.

## CLAIMS:

1. For use in an appliance (200) comprising a radio frequency (RF) receiver (210) capable of receiving at least one of a broadcast radio signal and a broadcast television signal when said appliance (200) is operating in a standby mode, an emergency warning system comprising:
  - 5 a detector (250) coupled to said RF receiver (210) capable of detecting an emergency code in said received at least one of a broadcast radio signal and a broadcast television signal and, in response to said detection of said emergency code, generating a first signal; and
  - a low power mode controller (255) coupled to and receiving said first signal
- 10 from said detector (250), wherein said low power mode controller (255), in response to said first signal switches said appliance (200) from said standby mode to an active mode wherein said RF receiver (210) processes and plays said received at least one of a broadcast radio signal and a broadcast television signal.
- 15 2. A television device (200) comprising:
  - an RF receiver (210) capable of receiving a broadcast television signal when at least a portion of said television device is operating in a standby mode and generating therefrom a baseband signal;
  - a detector (250) coupled to said RF receiver (210) capable of detecting an
- 20 emergency code in said baseband signal and, in response to said detection of said emergency code, generating a first signal;
- a low power mode controller (255) coupled to and receiving said first signal from said detector (250), wherein said low power mode controller (255), in response to said first signal, switches said at least a portion of said television device from said standby mode
- 25 to an active mode wherein said RF receiver (210) processes said received broadcast television signal; and
- a display (230) coupled to said RF receiver (210) for displaying said processed broadcast television signal.

3. For use in an appliance (200) comprising a radio frequency (RF) receiver (210) capable of receiving at least one of a broadcast radio signal and a broadcast television signal when the appliance (200) is operating in a standby mode, a method of responding to broadcast emergency warnings comprising the steps of:
- 5 detecting an emergency code in the received at least one of a broadcast radio signal and a broadcast television signal;
- in response to the detection of the emergency code, switching the appliance (200) from the standby mode to an active mode; and
- 10 playing the received at least one of a broadcast radio signal and a broadcast television signal.
4. The method of Claim 3 including the further step of, in response to the detection of the emergency code, tuning the RF receiver (210) to a first channel.
- 15
5. The emergency warning system of Claim 1 or the television device (200) of Claim 2 and further comprising a channel selection controller (260) coupled to said detector (250) wherein said channel selection controller (260) receives from said detector (250) a second signal capable of causing said channel selection controller (260) to tune said RF
- 20 receiver (210) to a first channel.
6. The emergency warning system or the television device (200) of Claim 5, or the method of Claim 4, wherein said first channel is a predetermined default channel.
- 25
7. The emergency warning system or the television device (200) of Claim 5, or the method of Claim 4, wherein said first channel is a last-selected channel to which said RF receiver (210) was tuned when said appliance (200) entered said standby mode.
8. The emergency warning system or the television device (200) of Claim 5, or
- 30 the method of Claim 4, wherein said first channel is determined by a data value associated with said emergency code.
9. The emergency warning system of Claim 1 or any one or more of Claims 5 to 8 when appended to Claim 1, or the television device (200) of Claim 2 or any one or more of

Claims 5 to 8 when appended to Claim 2, wherein said detector (250) is capable of controlling a volume level of said RF receiver (210).

10.           The emergency warning system or television device (200) of Claim 9, wherein  
5   said detector (250) causes said RF receiver (210) to increase a volume level of an audible  
signal associated with said at least one of a broadcast radio signal and a broadcast television  
signal.

11.           The method of Claim 3 or 4 or any one or more of Claims 6, 7 or 8 when  
10   appended to Claim 3 or 4 including the further step of controlling a volume level of the RF  
receiver (210).

12.           The method of Claim 11 wherein the step of controlling the volume comprises  
increasing the volume level of an audible signal associated with the least one of a broadcast  
15   radio signal.

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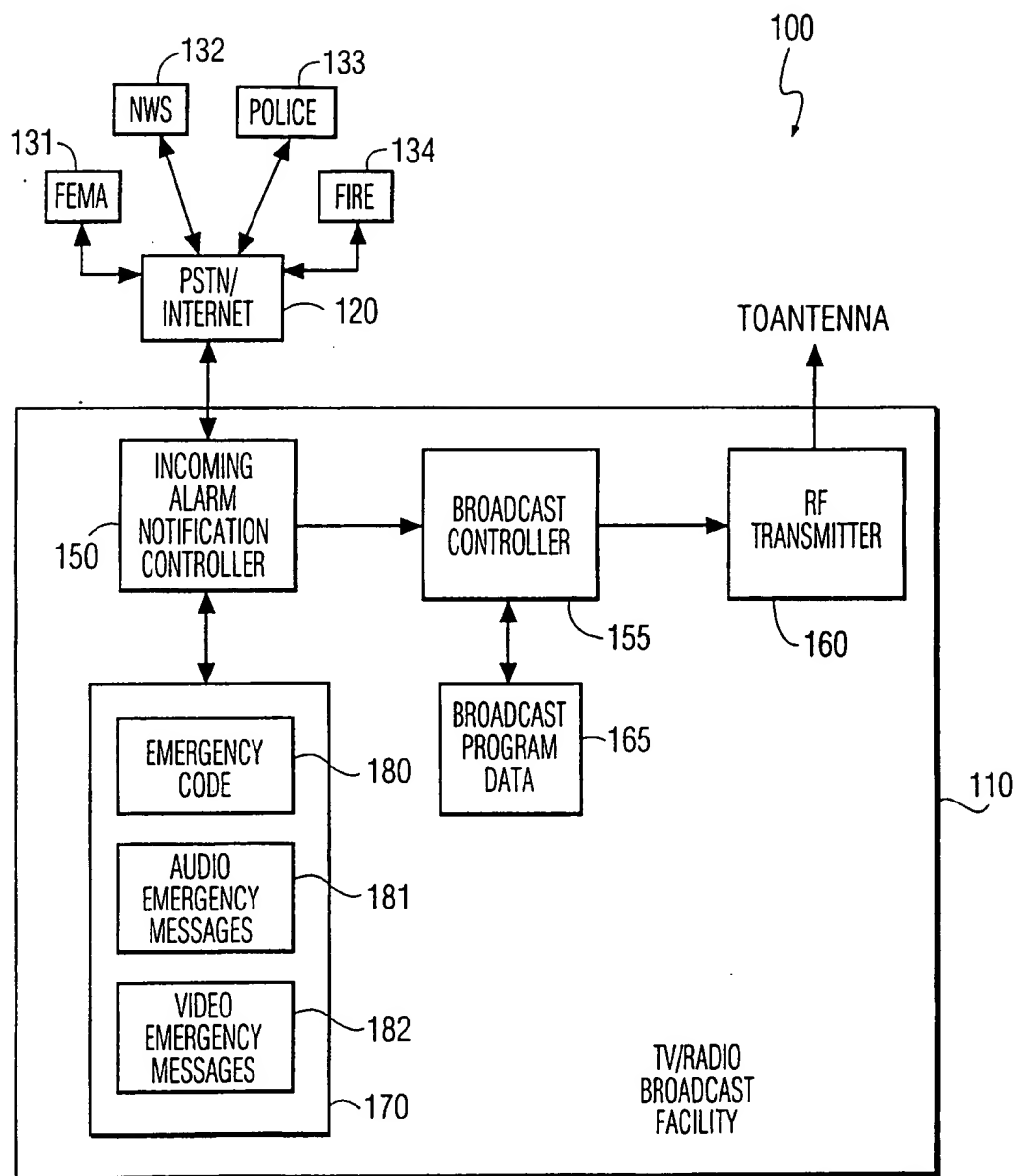


FIG. 1

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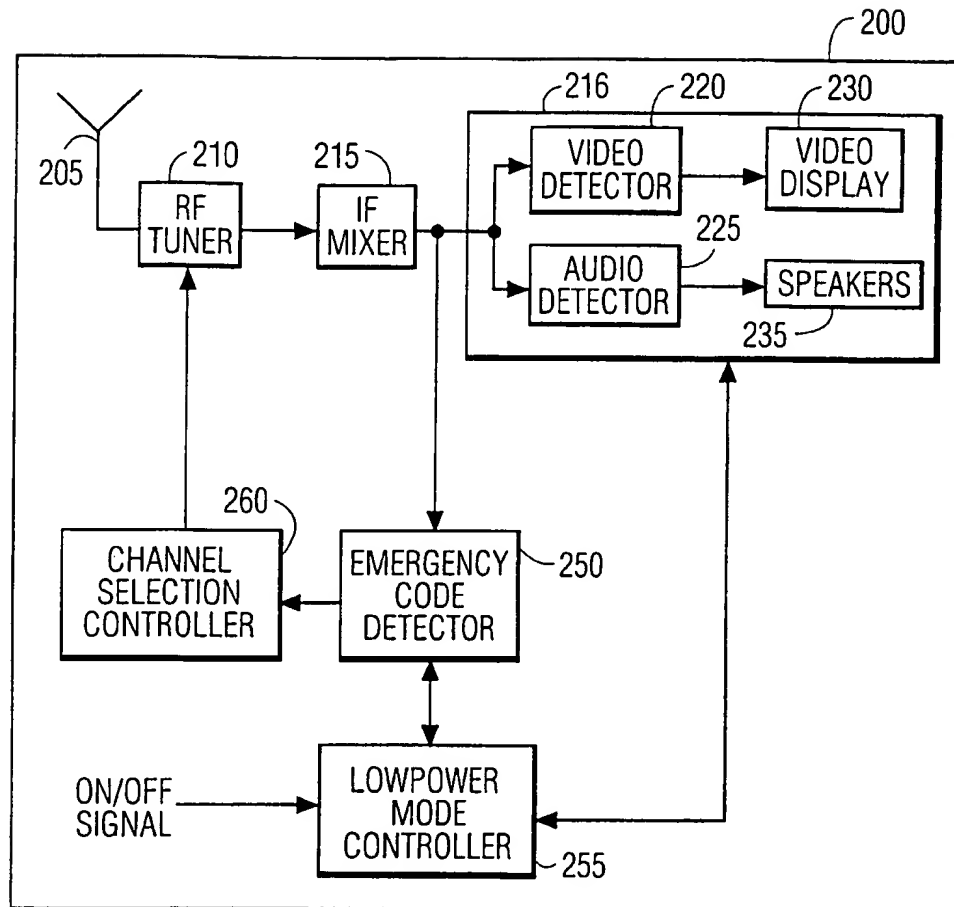


FIG. 2

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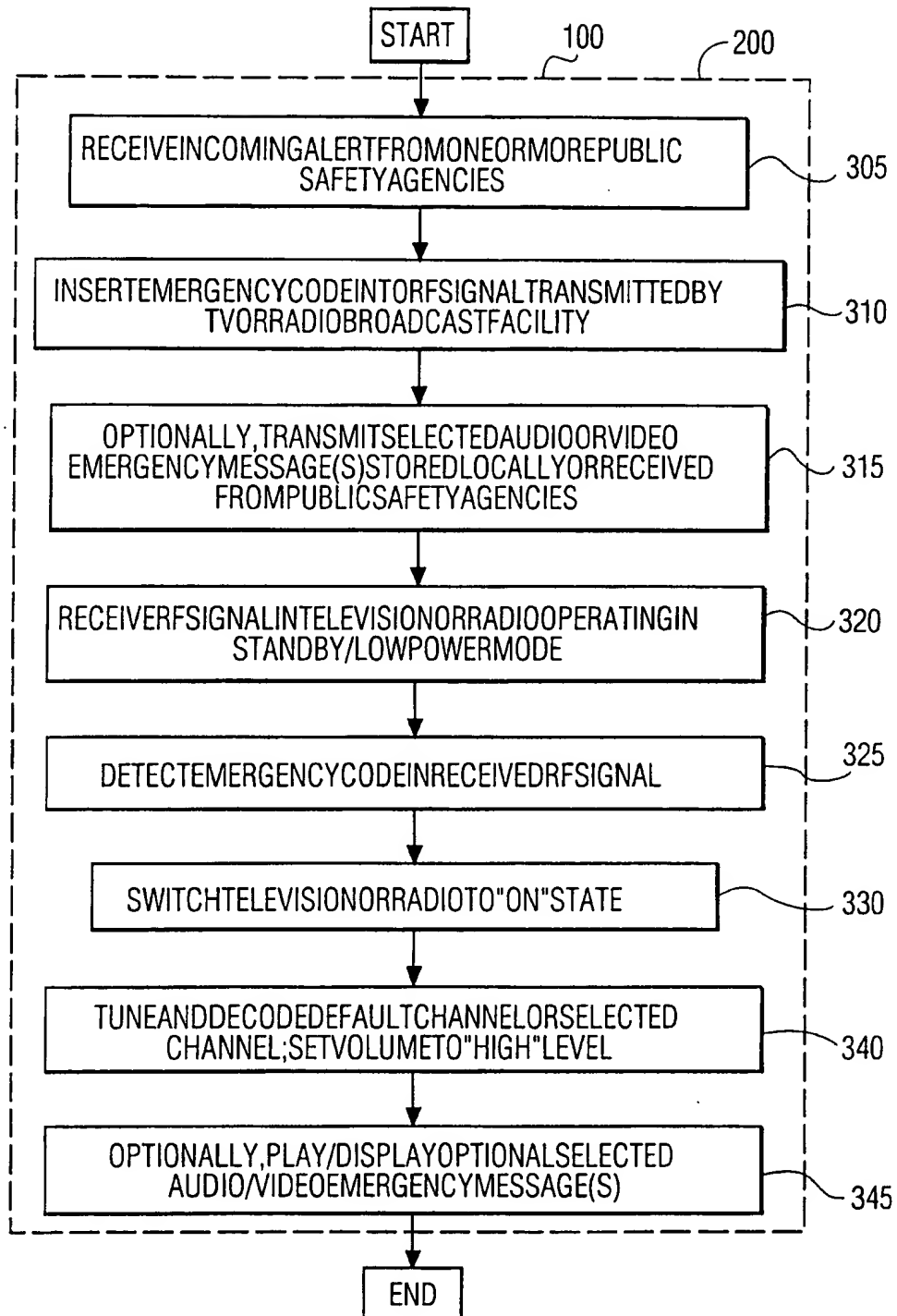


FIG. 3

300